

Sphenopalatine Ganglion Block - Novel Endoscopic Technique with 10% lignocaine for Chronic Primary Headache & Migraine

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Abstract

Background: This study aims to find the efficiency of endoscopic SPG block (Sphenopalatine ganglion block) as an alternative to medical treatment for chronic primary headache, such as migraine, non-specific headache, and unilateral facial pain. **Material and Methods:** Forty-five patients were enrolled in the study, and the single unilateral/bilateral endoscopic SPG block was performed by applying 10 % lignocaine at the site of SPG posterior to the middle turbinate with the help of a cotton tip applicator of Jobson's horn probe, guided by a 0-degree 4mm endoscope for direct visualization. Also, frequency & severity of pain were monitored. **Results:** A remarkable reduction in headache frequency and severity was observed in approximately 90% of patients. Pain was assessed using the NRS (numeric rating scale), and the mean NRS scores decreased significantly from baseline (7.2) to 1.3, 0.9, 0.6, and 0.7 at 15 mins, 1 hr, 24 hr, and 1 month after the procedure, respectively. PGIC (Patient Global Impression of Change) after the procedure was assessed using a Likert-type scale, and most patients rated their treatment results as very satisfied or satisfied. The procedure was found to be particularly beneficial in migraine and non-specific headaches but showed limited efficacy in tension headaches. **Conclusion:** The endoscopic SPG block with 10% lignocaine emerges as a promising intervention for chronic primary headache and migraine, demonstrating significant efficacy with minimal adverse effects. Its advantages, including direct visualization, accurate application, and a short application time, position it as a valuable addition to the therapeutic armamentarium for these challenging conditions.

Keywords: Sphenopalatine Ganglion Block, Endoscopic Technique, 10% Lignocaine, Chronic Primary Headache, Migraine, Trigeminal Autonomic Cephalalgia, Headache Management, Minimally Invasive Procedure, Intranasal Block, Pain Relief Therapy.

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INTRODUCTION

Chronic headache and migraine are devastating conditions that affect the quality of life for millions of individuals worldwide. Migrainous headache is chronic in nature with vascular etiology, and migraine episodes are recurrent in nature and require recurrent prophylactic & acute medical treatment. It is a common primary headache disorder that causes substantial debility, personal, social, and economic burden.^[1] According to the WHO, migraine is a prevalent condition, affecting 11% of the population worldwide.^[2] Migraines, atypical facial pain, and non-specific headaches can have a significant impact on an individual's quality of life, causing debilitating pain and distress. Despite the availability of various treatment options, many patients still struggle to find relief from their symptoms.^[3] It is reported that the pathogenesis of migraine is neurovascular in origin, which includes the trigeminal autonomic reflex, reflected through the SPG (sphenopalatine ganglion), otic ganglion & carotid ganglion.^[1]

The sphenopalatine ganglion (SPG), a small cluster of nerve cells, is part of the autonomic nervous system (ANS) and plays a role in controlling blood flow, pain sensation, and nasal secretions.^[4] It is a small triangular structure located close to the sphenopalatine foramen (SPF) posterior to the middle turbinate and maxillary sinus, anterior to the medial

plate of the pterygoid process, and inferior to the sphenoid sinus and maxillary nerve (MN).^[4] Trigeminal nerve gives the signal to SPG and various medical conditions such as migraines, cluster headaches, facial pain etc. have been linked to the dysfunction of SPG, which makes it a target for different therapeutic interventions like nerve blocks, neuro-modulation, radiofrequency etc.^[5-7] Since SPG plays a major role with numerous connections, it is of intense interest for developing targeted treatments, as conventional treatments like medications and lifestyle modifications don't provide enough relief to many patients. Innovative approaches, such as the sphenopalatine ganglion (SPG) block, have shown promise.^[8,9]

The use of SPG blocks for the treatment of headaches dates back a long time. Sluder in 1908 used a long needle with cocaine to block SPG, termed as Sluder's neuralgia,^[10] and this was further

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developed by Simon Ruskin,^[11] to treat trigeminal neuralgia, migraines, cluster headaches, etc.^[12,15] Different techniques have been used for SPG blocks, such as lidocaine-soaked cotton tip via the nose, trans-orally, trans-nasal endoscopic,^[13,14] and various non-invasive trans-nasal devices, such as the Tx360 nasal applicator, to inject anesthetics into the SPG.^[15] A better therapeutic outcome has been seen using 10% lignocaine via the trans nasal applicator method as compared to using 2% lignocaine via the transnasal spray method. Various etiologies have been postulated for the effective SPG block via the transnasal applicator method: direct mechanical stimulation of the SPG, absorption of local anesthetic through the mucous membrane, and blockade of parasympathetically mediated vasodilatation. The nasal spray method, on the contrary causes decreased diffusion of the drug across the mucous membrane, and a misplaced drug resulting in a lesser concentration of the drug reaching the effective site.^[16]

In this study, we focused on the use of 10% lignocaine via the endoscopic technique for SPG blockade. This is a unique approach that uses endoscopic instruments to locate and block the SPG precisely. This approach provides better visual control, allowing for more accurate placement of the medication. Our objective is to evaluate the efficacy of endoscopic SPG block in managing migraine headache, non-specific headache, and atypical facial pain by assessing changes in headache frequency, intensity, and duration, and the impact on overall quality of life. This research may help improve the management and quality of life for individuals affected by these challenging pain conditions.

MATERIALS AND METHODS

Study Design and Study Population

This study was conducted as an open, uncontrolled, prospective study at the ENT Dept of Military Hospital Bhopal from Aug 2022 to July 2023. Patients in the 20-55 age groups belonging to either sex with episodic headache history for at least 06 months duration, with at least one episode per week that could fit into ICHD-3 criteria for migraine without aura and also those with non-specific unilateral headache I facial pain /Tension Headache (who were not satisfied with past medical treatment) were recruited for this study.

Exclusion criteria:

1. Hypertension
2. Ischaemic heart disease
3. Type 2 diabetes mellitus
4. Rhinosinusitis/polypsis
5. Skull base fracture
6. Acute URTI-like infection
7. Coagulation disorders
8. Allergy to lignocaine
9. Age less than 20 years
10. Age more than 55 years

The study was performed in accordance with the ethical standards of the institute & the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards. Written consent was obtained from all patients.

Procedure: For all selected & screened patients, detailed history-taking and physical examination were carried out. Initial DNE (diagnostic nasal endoscopy) was performed to rule out nasal pathology & observe the target area for the PSG block. On the day of the procedure, the nasal mucosa was decongested using cottonoids soaked in xylometazoline nasal drops & 2% lignocaine with adrenaline 5 min before the procedure. Patients were seated in the ENT procedure chair in a normal sitting position. 0-degree 4mm endoscope prepared along with light source & camera. A cotton tip applicator made with Jobson's horn probe, which is sprayed with 10% lignocaine spray for application. Under endoscopic guidance, this Jobson probe was inserted into the nasal cavity, & 10% lignocaine was gently applied to the mucosa on the posterosuperior aspect of the posterior end of the middle turbinate. Lignocaine was used only for 8-10 sec & then gently removed. Sensation of heaviness/numbness on the right side of the face/forehead within 5 minutes of the procedure was taken as a marker of active block. A few patients reported the following side effects: numbness in the throat, a bitter taste in the mouth, mild discomfort in the nose, lacrimation, and a transient worsening of headache. Patients were sent off after 01 hour of observation. If indicated, a similar procedure was carried out on the other side in the same setting.

Methods of Measurement (Outcome Measures)

Pain was assessed using the NRS (numeric rating scale) with 0 = no pain and 10 = worst pain, recorded at 0 hours (baseline), 1 hr, 24 hrs, and 1 month post-SPG block procedure. Further, we took PGIC (patient global impression of change). We assessed the patient's perceived improvement/worsening after the intervention. The scale ranges from 1 to 7. 1-Very much improved, 2- Much improved, 3-Minimally improved, 4-No change, 5-Minimally worse, 6-Much worse, and 7-Very much worse.

Patient satisfaction was assessed using a Likert-type scale (very satisfied-5, somewhat satisfied-4, neither satisfied nor dissatisfied-3, somewhat dissatisfied-2, very dissatisfied-1). Frequency of headache episodes was also monitored for Migrainous headache & non-specific headache.

The data were statistically analyzed by using SPSS software Version 23.

RESULTS

Forty-five patients received unilateral/bilateral endoscopic SPG block by applying 10% lignocaine at the site of SP ganglion posterior to the middle turbinate with the help of a cotton tip applicator. 45 patients received SPG blocks in a transnasal manner (10 bilaterally & 35 unilaterally).

86.66% of patients were females aged 20-55 years, with a mean age of 36.8 years. The mean NRS scores showed a significant decrease in pain severity/intensity from a baseline of 7.2 to 1.3, 0.9, 0.6, and 0.7 at 15 mins, 1 hr, 24 hr, and 1 month after the SPG block procedure, respectively. There was a significant decrease in headache frequency and intensity after the SPG block treatment ($p < 0.001$), with a percentage improvement of around 90%, indicating a significant improvement. Patient satisfaction was assessed using a five-point Likert-type scale, and most patients rated the procedure as very satisfied or satisfied. The SPG block procedure was well tolerated, as very few adverse

events were recorded.

The procedure is safe & effective, thus can be repeated at intervals. In the present study, the procedure was repeated in 08 patients with migrainous headache after 03 months, with significant improvement.

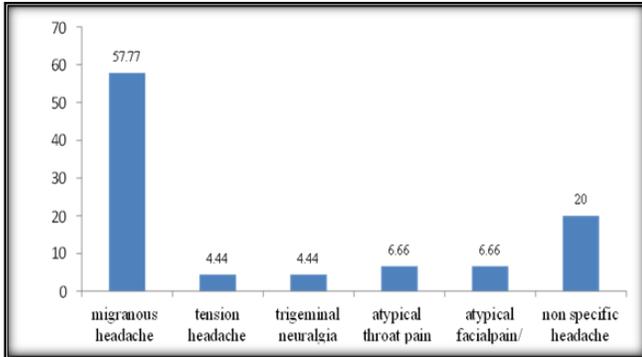


Figure 1: shows distribution of 45 patients selected for the study. The percentage of patients with migrainous headache (57.77%); tension headache (4.44%); trigeminal neuralgia (4.44%); atypical throat pain (6.66%), atypical facial pain (6.66%) and non-specific headache (20%).

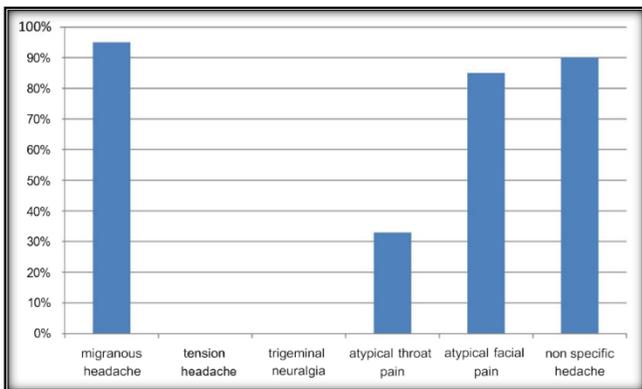


Figure 2: shows % of particular pain disorder showing improvement after SPG block, with significant improvement in migrainous headache, atypical facial pain, non-specific headache & no improvement in tension headache /trigeminal neuralgia

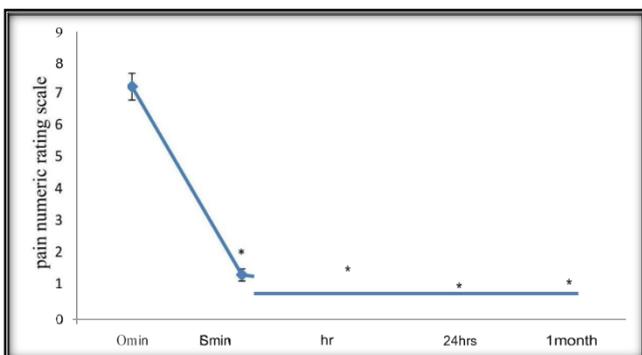


Figure 3: shows the mean pain NRS at baseline & 15 mins, 1 hour, 24 hrs and 1 month after treatment (for cases of migrainous headache, atypical facial pain, non-specific headache), showing significant decrease in severity of pain. Each bar represents mean ± SEM of three independent observations.

* represents the significance at $p < 0.05$ compared to baseline.

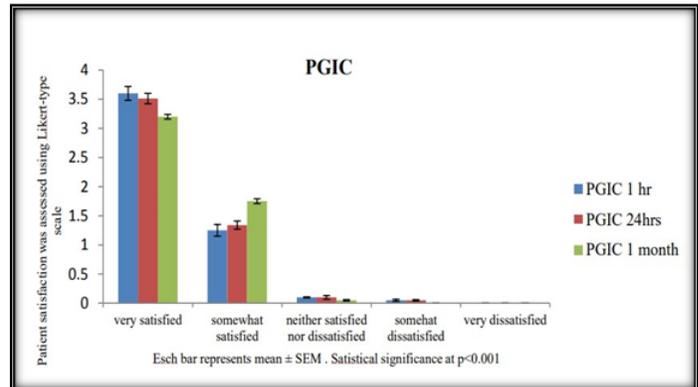


Figure 4: PGIC after the SPG block procedure 1hr, 24hr and 1 month, (for cases of migraine headache, atypical facial pain, non-specific headache) most of the patients rated the treatment results are very satisfied or satisfied. Patient satisfaction was assessed using Likert type scale (very satisfied-5, somewhat satisfied-4, neither satisfied nor dissatisfied-3, somewhat dissatisfied-2, very dissatisfied-1)

Table 1: Comparison of headache frequency (per month) before and after SPG block treatment. (for cases of migrainous headache, non-specific headache)

Condition	Headache Frequency (Mean +/- SD)	Range
Pre-treatment	16 +/- 5.8	10-25
Post-treatment	2 +/- 1.8	0-5

Statistical Analysis:

- Test used: Paired t-test (assuming normal distribution of frequency data).
- p-value: < 0.001.

The very low p-value (<0.001) indicates that the reduction in headache frequency is statistically significant, suggesting the observed changes are unlikely to be due to random chance.

There were very few side effects observed post-procedure, including nasal & throat discomfort/heaviness (70%); dizziness (2%); nausea (5%); transient worsening of headache (2%); and 1 case developed mild epistaxis. Endoscopic assessment in the left nasal cavity showed a mild mucosal bleed near the posterior end of the middle turbinate after the application of the cotton tip applicator. It was treated conservatively, with digital pressure and ice packs applied to the nose.

DISCUSSION

The SPG block has gained attention as a promising technique for the management of various neuralgias, such as migraine headache, atypical facial pain, and non-specific headaches. In the present study, we demonstrate that a single unilateral/bilateral endoscopic SPG block, performed by applying 10% lignocaine at the site of the SP ganglion, is an effective, safe, and novel therapy for migrainous headaches, atypical facial pain, and non-specific headaches. The mean NRS scores decreased significantly from baseline (7.2) to 1.3, 0.9, 0.6, and 0.7 at 15 mins, 1 hr, 24 hr, and 1 month after the SPG block procedure, respectively. There was a significant decrease in headache

frequency and intensity after the SPG block treatment ($p < 0.001$), with a percentage improvement of around 90%, indicating a significant improvement. The reduction in pain intensity, frequency, and duration observed in our study is consistent with the existing literature,^[17-19] suggesting that targeting SPG can be an attractive and effective strategy for managing migraines. M. S. Robbins et al. (2016) reported in their book that a number of studies have been published on SPG blockade in acute migraine, with variable results.^[1] In a survey by Kudrow et al., 55% of patients with migraine achieved complete headache relief for up to 24 hrs with 4% intranasal lidocaine.^[17] Tepper et al. (2018) reported that the SPG block significantly reduced pain intensity and improved pain-related disability, suggesting that it holds promise as a therapeutic option for patients with pain.^[20] These findings support our research; however, it is essential to note that responses to SPG block may vary among individuals, and further research is needed to identify predictors of treatment success.

Further, we checked the mean pain numeric at baseline & 15 mins, 1 hour, 24 hrs, and 1 month after treatment, showing a significant decrease in pain severity. The results show that the SPG block led to a substantial reduction in headache frequency and severity. The mean NRS scores showed a significant decrease from a baseline of 7.2 to 1.3, 0.9, 0.6, and 0.7 at 15 mins, 1 hr, 24 hr, and 1 month after the SPG block procedure, respectively [Figure 3]. Previous studies have reported similar results where SPG blocks decreased the headache intensity.^[20] The results from our study suggest that the SPG block may help in managing migraine headaches, atypical facial pain, and non-specific headaches, providing relief for patients who do not respond well to conventional treatments. The precise application of 10% lignocaine using an endoscopic technique allows accurate delivery, potentially enhancing its efficacy. Furthermore, the study highlights the novel endoscopic approach, which provides better visualization and accuracy, as a key factor in achieving significant and lasting results. However, further investigation is needed to understand better the underlying mechanisms and the long-term efficacy of SPG block.

PGIC was assessed using a 5-point Likert-type self-assessment scale. Most of the patients rated the procedure as very satisfied or satisfied. Statistical significance was considered at $p < 0.001$. Previously, Akin et al. observed patient satisfaction using the PGIC scale, a 5-point self-reported scale for evaluating the treatment of post-dural puncture headache with bilateral greater occipital nerve block.^[21] Yousuf et al. (2021) used PGIC for Sphenopalatine ganglion versus greater occipital nerve blocks in treating post-dural puncture headache after spinal anesthesia for cesarean section.^[22] In that study, patient satisfaction levels after SPGB were similar to those after the Greater Occipital Nerve Block. The present study shows improved results and is a novel procedure that improves the condition of patients with migrainous headache, atypical facial pain, and non-specific headaches.

In the present study, the SPG block was safe and well-tolerated, with only mild adverse effects observed. Murty et al. in their study also reported that endoscopic SPG blocks

have a low risk of complications.^[14] Studies are using the endoscopic technique for SPG block,^[14] & using 10% lignocaine intranasally for SPG block in PDPH (post-dural puncture headache).^[16] However, ours is a first-of-its-kind study wherein we have used an endoscopic technique with the application of 10% lignocaine for a single unilateral/bilateral block at the site of the SP ganglion. The procedure reported minimal adverse effects, as evident from the results. Moreover, we achieved better results in patients with migrainous headaches, atypical facial pain, and non-specific headaches wherein all patients reported no or very mild episodes of pain at 3-month follow-up. However, the exact mechanisms underlying the therapeutic efficacy of SPG blocks are an interesting area of research, since the SPG ganglion plays an essential role in mediating pain signals, and its blockade may interrupt the pain pathway and provide relief. Future research may focus on explicating the neurological and physiological changes associated with SPG block.^[19] Also, it is to be noted that inadequate treatment for acute migraine leads to new onset chronic migraine & many times medication alone provides very inadequate treatment.^[23,24] Thus, the SPG block can play a crucial role in reducing the burden of chronic primary headache & migraine in society.

Furthermore, our study provides valuable insights. Several areas need to be explored using large-scale randomized controlled trials, separately for each pain condition mentioned, with longer follow-up periods required to establish the long-term efficacy and durability of the SPG block. Moreover, there is scope for conducting comparative studies evaluating the effectiveness of SPG block compared with other treatment modalities, which would provide valuable insights into its place in the treatment algorithm for migraine headache, atypical facial pain, and non-specific headaches.

Limitations of the study:

Open, uncontrolled prospective study: The absence of a control group limits the ability to draw definitive conclusions about the efficacy of the intervention compared to placebo or other treatments.

No randomization/blinding was implemented, which increases the risk of bias in assessing outcomes.

A small sample size of only 45 patients was included in the study, which reduced the generalizability of the findings to a larger and more diverse population.

Subjective outcome measures- Pain relief was assessed using self-reported tools like the Numeric Rating Scale (NRS) and Patient Global Impression of Change (PGIC). While these are standard tools, they are subjective and prone to bias, especially in an unblinded study.

Short follow-up duration.

Clinical Efficacy

The novel single unilateral/bilateral endoscopic SPG block, performed by applying 10% lignocaine at the SP ganglion, has shown efficacy in the management of chronic headaches and migraines. However, individual responses may vary. Many patients have reported a significant reduction in the frequency and severity of their headaches following the procedure, which makes it a valuable option for those who have not responded well to traditional treatments. The procedure is very safe & effective, and can be repeated after 03 months in patients with recurrent

symptoms.

CONCLUSION

In conclusion, the present study shows that the endoscopic SPG block represents a notable advancement in the management of chronic headaches and migraines. Since it is a minimally invasive procedure and offers a targeted approach to relieve pain and improve the quality of life for individuals suffering from these debilitating conditions, it should be considered as one of the earliest options for treating these conditions. As more and more research is being conducted in this field, the endoscopic SPG block may become an increasingly valuable tool in the comprehensive treatment of chronic headaches and migraines.

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Conflicts of interest

There are no conflicts of interest.

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